

VII. Environment

Environment includes a discussion on deforestation and greenhouse gas emissions. Indicators related to land use, forest resources, air and water pollution, and per capita freshwater resources are presented in the statistical tables.

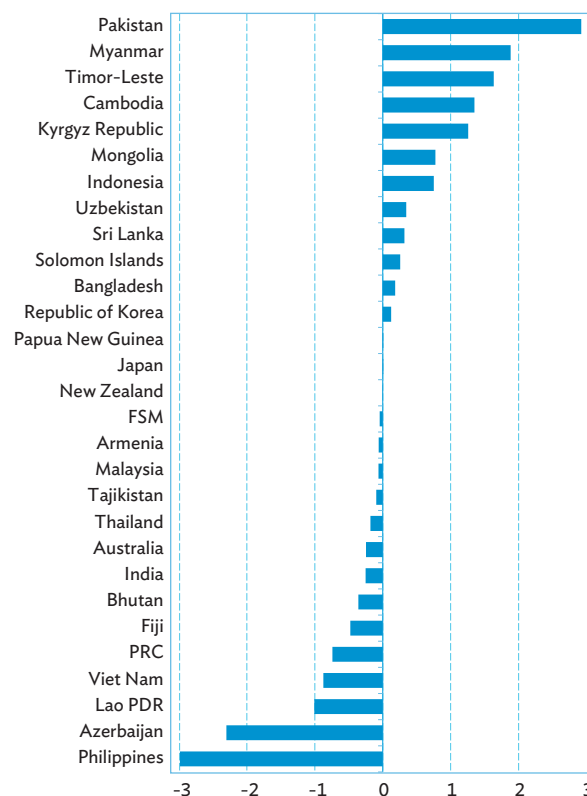
The amount of forested land is declining in about one-third of Asia and Pacific economies.

An estimated 1.6 billion people use forests for all or part of their livelihoods, while millions more depend on forest resources for clean air and fresh water. By absorbing and storing massive amounts of carbon dioxide (CO₂), forests play a crucial role in the fight against climate change.⁵

In 2016, 15 of the 46 regional economies with available data reported an increase in total forested land, 14 economies reported a decrease, and 17 reported no change (Table 2.7.2).

The region's highest rates of deforestation in 2016 were in Pakistan (2.9%), Myanmar (1.9%), and Timor-Leste (1.6%) as shown in Figure 2.7.1. The highest rates of negative deforestation (i.e., reforestation) occurred in the Philippines (–3.0%), Azerbaijan (–2.3%), and the Lao People's Democratic Republic (–1.0%).

Figure 2.7.1: Deforestation Rates in Select Economies of Asia and the Pacific, 2016
(%)



FSM = Federated States of Micronesia, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Note: A negative deforestation rate implies an increase in the forested area compared with the previous year (i.e., "reforestation"). Deforestation rates for Afghanistan; Brunei Darussalam; the Cook Islands; Georgia; Kazakhstan; Kiribati; Maldives; the Marshall Islands; Nepal; Palau; Samoa; Singapore; Taipei, China; Tonga; Turkmenistan; Tuvalu; and Vanuatu are zero.

Source: Table 2.7.2, Key Indicators for Asia and the Pacific 2019.

[Click here for figure data](#)

⁵ For more information about the role of forests in the Earth's environment, go to <https://www.un-redd.org/forest-facts>.

Carbon emissions per capita increased in about 85% of Asia and Pacific economies between 2000 and 2014.

In 2014, Asia and the Pacific accounted for nearly half (47.7%) of all global CO₂ emissions. The region's highest emitters were the PRC (28.5% of global emissions), India (6.2%), Japan (3.4%), the Republic of Korea (1.6%), and Indonesia (1.3%). Together, these five economies accounted for more than 90% of the region's total emissions (ADB 2018). Rising living standards in Asia and the Pacific have been associated with rising CO₂ emissions as power generation and the use of energy-consuming goods, such as cars and air-conditioning units, increase (ADB 2013).

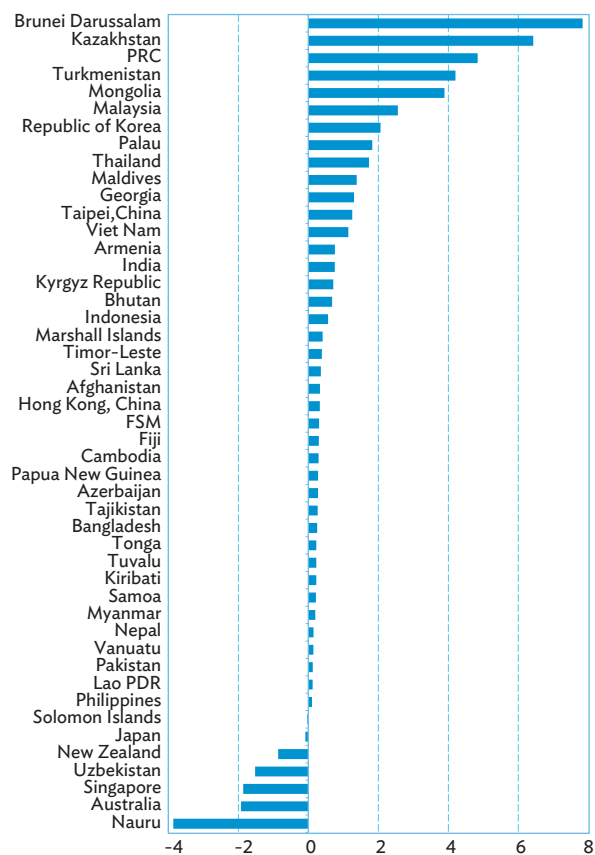
From 2000 to 2014, only 7 of the 47 regional economies with available data were successful in reducing CO₂ emissions on a per capita basis (Figure 2.7.2). Among this group, the largest reductions occurred in Nauru (3.9 thousand tons of CO₂ emissions per capita), Australia (1.9 thousand tons), and Singapore (1.9 thousand tons). The largest increases occurred in Brunei Darussalam (7.8 thousand tons of CO₂ emissions per capita), Kazakhstan (6.4 thousand tons), and the PRC (4.8 thousand tons).

Data Issues and Comparability

Data on greenhouse gases (GHGs) have been compiled from the Emissions Database for Global Atmospheric Research, a joint project of the European Commission Joint Research Centre and the Netherlands Environmental Assessment Agency. This database applies a technology-based emissions factor approach consistently for all economies. It utilizes a consistent set of activity data for calculating various substances, GHGs, and air pollutants; and relies on the spatial allocation of emissions on a 0.1-degree by 0.1-degree grid.

There may be substantial uncertainty in data for individual economies—especially for methane, nitrous

Figure 2.7.2: Change in Carbon Dioxide Emissions in Select Economies of Asia and the Pacific, 2000–2014
(t '000 per capita)



t = metric ton, FSM = Federated States of Micronesia, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Note: Only economies with available data for both 2000 and 2014 are included. For Taipei, China, data refer to 2001 and 2015.

Source: ADB estimates using Table 2.7.2 and Table 2.1.1, Key Indicators for Asia and the Pacific 2019.

[Click here for figure data](#)

oxide, and other GHGs—due to the limited accuracy of international activity data and the emission factors selected for calculating emissions on an economy level. However, since Intergovernmental Panel on Climate Change methodologies are consistently used, and data are based on international information sources, there is sound basis for comparability.⁶

The Food and Agriculture Organization of the UN monitors land use and forestry data, using its own expert sources, country reports, satellite imagery, and official data gathered through questionnaires conducted by the organization.

⁶ For more information on the methodologies of the Emissions Database for Global Atmospheric Research, go to <http://edgar.jrc.ec.europa.eu/methodology.php>.

Table 2.7.1: Agriculture Land Use
(% of total land area)

ADB Regional Member	Agricultural Land				Arable Land				Permanent Cropland			
	2000	2005	2010	2016	2000	2005	2010	2016	2000	2005	2010	2016
Developing ADB Member Economies												
Central and West Asia												
Afghanistan	57.8	58.1	58.1	58.1	11.8	12.0	11.9	11.8	0.1	0.2	0.2	0.3
Armenia	46.5	56.4	60.9	58.9	15.8	16.0	15.8	15.7	1.3	1.8	1.9	2.0
Azerbaijan	57.4	57.6	57.7	57.7	22.1	22.3	22.8	24.2	2.9	2.7	2.8	2.9
Georgia	43.2	36.3	35.4	34.5	11.4	6.8	5.7	5.0	3.9	1.6	1.8	1.6
Kazakhstan	79.8	78.6	80.4	80.4	11.2	10.6	10.6	10.9	0.1	0.0	0.0	0.0
Kyrgyz Republic	55.9	56.0	55.3	55.0	7.1	6.7	6.7	6.7	0.3	0.4	0.4	0.4
Pakistan	47.6	46.7	45.7	47.8	40.3	39.1	38.1	40.3	0.9	1.0	1.1	1.0
Tajikistan	32.7	33.4	34.0	34.1	5.6	5.4	5.3	5.3	0.7	0.8	1.0	1.0
Turkmenistan	75.5	74.2	72.4	72.0	4.1	4.3	4.1	4.1	0.1	0.1	0.1	0.1
Uzbekistan	64.2	62.9	62.7	62.9	10.5	10.3	10.2	10.3	0.8	0.8	0.8	0.9
East Asia												
China, People's Republic of	55.6	55.1	54.8	56.2	12.6	12.0	11.4	12.7	1.2	1.3	1.5	1.7
Hong Kong, China	6.7	6.7	5.2	4.8	4.8	4.8	3.3	2.9	1.0	1.0	1.0	1.0
Korea, Republic of	20.5	19.4	18.2	17.4	17.8	17.0	15.5	14.6	2.1	1.9	2.1	2.3
Mongolia	84.0	73.0	73.1	71.5	0.8	0.4	0.4	0.4	0.0	0.0	0.0	0.0
Taipei, China	24.0	23.5	23.0	22.4	17.5	17.0	16.9	16.6	6.5	6.5	6.1	5.8
South Asia												
Bangladesh	72.2	71.5	71.0	70.6	64.1	60.8	59.9	59.6	3.5	6.1	6.5	6.4
Bhutan	13.3	15.6	13.6	13.6	2.7	4.4	2.6	2.6	0.5	0.5	0.3	0.2
India	60.9	60.6	60.4	60.4	54.1	53.6	52.8	52.6	3.1	3.4	4.1	4.4
Maldives	30.0	30.0	26.3	26.3	10.0	10.0	13.0	13.0	16.7	16.7	10.0	10.0
Nepal	29.6	29.3	28.8	28.7	16.4	15.9	15.2	14.7	0.8	0.9	1.1	1.5
Sri Lanka	37.5	40.0	41.8	43.7	14.6	17.5	19.1	20.7	15.9	15.5	15.6	15.9
Southeast Asia												
Brunei Darussalam	1.9	2.1	2.5	2.7	0.4	0.4	0.8	0.9	0.8	0.9	1.1	1.1
Cambodia	27.0	30.3	30.9	30.9	21.0	21.0	21.5	21.5	0.8	0.9	0.9	0.9
Indonesia	26.0	28.6	30.7	31.5	11.3	12.7	13.0	13.0	8.6	9.9	11.6	12.4
Lao People's Democratic Republic	7.8	8.6	9.6	10.3	4.0	5.0	6.1	6.6	0.4	0.4	0.6	0.7
Malaysia	21.1	21.7	22.5	26.3	2.6	2.9	2.6	2.7	17.6	18.0	19.0	22.7
Myanmar	16.5	17.2	19.2	19.5	15.2	15.4	16.5	16.7	0.9	1.4	2.2	2.4
Philippines	37.7	38.1	40.6	41.7	16.9	16.8	17.8	18.7	15.8	16.3	17.8	17.9
Singapore	1.8	1.1	1.1	0.9	1.5	1.0	0.9	0.8	0.3	0.1	0.1	0.1
Thailand	38.8	38.4	41.2	43.3	30.6	29.8	30.8	32.9	6.6	7.1	8.8	8.8
Viet Nam	28.2	32.4	34.7	39.3	19.9	20.5	20.8	22.6	6.2	9.8	11.9	14.6
The Pacific												
Cook Islands	20.0	11.4	5.6	6.3	7.5	5.2	2.9	4.2	12.5	6.2	2.7	2.1
Fiji	23.4	23.4	23.3	23.3	9.3	9.3	9.0	9.0	4.5	4.5	4.7	4.7
Kiribati	42.0	42.0	42.0	42.0	2.5	2.5	2.5	2.5	39.5	39.5	39.5	39.5
Marshall Islands	66.7	72.2	72.2	63.9	5.6	11.1	11.1	11.1	44.4	44.4	44.4	36.1
Micronesia, Federated States of	32.1	32.1	31.4	31.4	3.6	3.6	2.9	2.9	24.3	24.3	24.3	24.3
Nauru	20.0	20.0	20.0	20.0	-	-	-	-	20.0	20.0	20.0	20.0
Niue	18.5	18.5	19.2	19.2	3.8	3.8	3.8	3.8	10.8	10.8	11.5	11.5
Palau	10.9	10.9	10.9	10.9	2.2	2.2	2.2	2.2	4.3	4.3	4.3	4.3
Papua New Guinea	2.2	2.3	2.6	2.6	0.5	0.5	0.7	0.7	1.4	1.3	1.5	1.5
Samoa	17.0	14.8	12.4	12.4	4.9	3.9	2.8	2.8	11.0	9.5	7.8	7.8
Solomon Islands	2.7	3.2	3.8	3.9	0.5	0.6	0.7	0.7	2.0	2.3	2.9	2.9
Timor-Leste	22.7	25.9	25.0	25.6	8.1	11.4	10.1	10.4	4.5	4.4	4.8	5.0
Tonga	41.7	41.7	44.4	45.8	20.8	20.8	23.6	25.0	15.3	15.3	15.3	15.3
Tuvalu	66.7	56.7	60.0	60.0	-	-	-	-	66.7	56.7	60.0	60.0
Vanuatu	14.4	15.0	15.3	15.3	1.6	1.6	1.6	1.6	9.3	9.9	10.3	10.3
Developed ADB Member Economies												
Australia	59.3	57.9	51.9	48.2	6.2	6.4	5.5	6.0	0.0	0.0	0.1	0.0
Japan	14.4	12.9	12.6	12.3	12.3	12.0	11.7	11.5	1.0	0.9	0.9	0.8
New Zealand	58.5	44.5	43.3	40.5	5.7	1.6	1.9	2.2	0.2	0.2	0.3	0.3

- = magnitude equals zero, 0.0 = magnitude is less than half of unit employed, ADB = Asian Development Bank.

Source: Food and Agriculture Organization of the United Nations. FAOSTAT Database. <http://www.fao.org/faostat/en/#data/RL> (accessed 21 May 2019).

Pollution

Table 2.7.2: Deforestation and Pollution

ADB Regional Member	Deforestation Rate ^a (average % change)		Carbon Dioxide Emissions ^b (t '000)		Nitrous Oxide Emissions (t '000 CO ₂ equivalent)	
	2000	2016	2000	2014	2000	2012
Developing ADB Member Economies						
Central and West Asia						
Afghanistan	-	-	774	9,809	3,317	3,424
Armenia	0.06	-0.06	3,465	5,530	462	1,023
Azerbaijan	-0.23	-2.30	29,508	37,488	2,030	2,673
Georgia	-0.03	-	4,536	8,988	2,437	2,352
Kazakhstan	0.17	-	118,099	248,315	14,865	17,822
Kyrgyz Republic	-0.26	1.26	4,635	9,608	1,452	1,567
Pakistan	1.91	2.92	106,449	166,298	26,350	30,651
Tajikistan	-0.05	-0.10	2,237	5,189	1,110	1,848
Turkmenistan	-	-	37,539	68,423	3,046	4,924
Uzbekistan	-0.52	0.35	121,829	105,214	9,610	13,192
East Asia						
China, People's Republic of	-1.13	-0.74	3,405,180	10,291,927	414,138	587,166
Hong Kong, China	...	...	40,440	46,223	513	476
Korea, Republic of	0.13	0.12	447,561	587,156	18,576	14,979
Mongolia	0.69	0.77	7,506	20,840	5,058	3,548
Taipei, China	-	-(2017)	230,022 (2001)	271,013 (2015)	3,845 (2001)	4,506 (2015)
South Asia						
Bangladesh	0.18	0.18	27,869	73,190	20,770	26,683
Bhutan	-0.38	-0.36	396	1,001	281	555
India	-0.22	-0.25	1,031,853	2,238,377	207,700	239,755
Maldives	-	-	451	1,335	12	27
Nepal	2.30	-	3,069	8,031	4,232	4,598
Sri Lanka	0.42	0.32	10,238	18,394	2,044	2,174
Southeast Asia						
Brunei Darussalam	0.40	-	4,712	9,109	395	342
Cambodia	1.20	1.35	1,977	6,685	3,295	16,685
Indonesia	1.89	0.75	263,419	464,176	94,933	93,139
Lao People's Democratic Republic	0.67	-1.01	939	1,955	3,265	8,987
Malaysia	0.36	-0.06	125,734	242,821	13,822	15,310
Myanmar	1.23	1.88	10,088	21,632	31,300	26,783
Philippines	-0.68	-2.99	73,307	105,654	12,365	12,762
Singapore	-	-	49,006	56,373	6,635	1,909
Thailand	-1.80	-0.18	181,271	316,213	18,677	30,833
Viet Nam	-2.06	-0.87	53,645	166,911	19,746	34,494
The Pacific						
Cook Islands	-0.47	-	...	...	...	...
Fiji	-0.28	-0.48	843	1,170	343	344
Kiribati	-	-	29	62	3	4
Marshall Islands	-	-	77	103	0	0
Micronesia, Federated States of	-0.05	-0.05	125	150	11	11
Nauru	...	...	84	48	0	0
Niue	...	...	...	...	...	...
Palau	-0.38	-	249	260	0	0
Papua New Guinea	0.01	0.01	2,666	6,318	1,613	1,234
Samoa	-2.46	-	143	198	37	40
Solomon Islands	0.25	0.26	150	202	2,425	2,656
Timor-Leste	1.29	1.63	-	469	164	226
Tonga	-	-	95	121	22	22
Tuvalu	-	-	7	11	1	1
Vanuatu	-	-	84	154	118	109
Developed ADB Member Economies						
Australia	-0.02	-0.25	329,443	361,262	75,581	54,247
Japan	0.03	0.01	1,220,528	1,214,048	30,411	24,911
New Zealand	-0.48	-0.00	32,981	34,664	11,549	11,880

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Table 2.7.2: Deforestation and Pollution (continued)

ADB Regional Member	Methane Emissions (t'000 CO ₂ equivalent)		Other Greenhouse Gases ^c (t'000 CO ₂ equivalent)	
	2000	2012	2000	2012
Developing ADB Member Economies				
Central and West Asia				
Afghanistan	9,384	13,763	126	349
Armenia	2,565	3,426	112	710
Azerbaijan	9,955	19,955	464	1,142
Georgia	4,137	5,019	3	227
Kazakhstan	38,779	71,350	14,065	30,363
Kyrgyz Republic	3,486	4,291	93	68
Pakistan	117,125	158,337	757	1,159
Tajikistan	3,304	5,408	798	367
Turkmenistan	21,241	22,009	124	595
Uzbekistan	37,233	47,333	298	989
East Asia				
China, People's Republic of	1,043,400	1,752,290	104,677	251,254
Hong Kong, China	2,695	3,147	155	150
Korea, Republic of	30,916	32,625	14,934	8,968
Mongolia	9,218	6,257	26,233	2,216 (2010)
Taipei, China	12,215 (2001)	5,449 (2015)	6,304 (2001)	3,052 (2015)
South Asia				
Bangladesh	89,247	105,142	686	1,329
Bhutan	1,032	1,770	644	488
India	561,733	636,396	56,626	153,658
Maldives	34	52	...	...
Nepal	21,206	23,982	2,443	7,995
Sri Lanka	9,606	11,864	441	91
Southeast Asia				
Brunei Darussalam	3,882	4,539	101	427
Cambodia	14,985	35,915	23,021	73,300
Indonesia	170,032	223,316	63,048	2,556
Lao People's Democratic Republic	7,219	15,011	13,588	136,841
Malaysia	29,309	34,271	5,144	3,866
Myanmar	66,942	80,637	78,176	406,274
Philippines	49,911	57,170	12,487	3,891
Singapore	1,684	2,386	1,889 (2001)	3,299
Thailand	83,564	106,499	8,756	45,556
Viet Nam	75,430	113,564	5,782	25,707
The Pacific				
Cook Islands	...	...	...	...
Fiji	705	715	9	52
Kiribati	13	16	-	-
Marshall Islands	6	8	...	...
Micronesia, Federated States of	28	30	...	...
Nauru	3	3	...	...
Niue	...	...	...	...
Palau	1	1	...	...
Papua New Guinea	2,001	2,143	1,949	2,188
Samoa	116	133	-0	0
Solomon Islands	1,394	1,449	0	0
Timor-Leste	450	732	-	-0
Tonga	58	61	-0	...
Tuvalu	3	3	-0	0
Vanuatu	267	254	0	-0
Developed ADB Member Economies				
Australia	128,133	125,588	520,911	174,653
Japan	47,496	38,957	51,527	71,746
New Zealand	26,584	28,658	1,506	1,764

... = data not available, - = magnitude equals zero, -0 or 0 = magnitude is less than half of unit employed, ADB = Asian Development Bank, CO₂ = carbon dioxide, t = metric ton.

- a Rate refers to percentage change over previous year. A negative value indicates that the deforestation rate is decreasing (i.e., reforestation).
b Data from the World Bank are expressed in kilotons, while data provided in the table are expressed in thousands of metric tons, using a conversion factor of 1 kiloton = 1,000 metric tons.
c Other greenhouse gas emissions refer to hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.

Sources: Food and Agriculture Organization of the United Nations. FAOSTAT Database. <http://www.fao.org/faostat/en/#data/RL> (accessed 25 July 2019); and World Bank. World Development Indicators Online. <http://data.worldbank.org/indicator> (accessed 25 July 2019). For Taipei, China: Government of Taipei, China, Directorate-General of Budget, Accounting and Statistics. Statistical Yearbook 2017. https://eng.dgbas.gov.tw/public/data/dgbas03/bs2/yearbook_eng/Yearbook2017.pdf (accessed 22 May 2019).

Freshwater

Table 2.7.3: Freshwater Resources

ADB Regional Member	Internal Renewable Freshwater Resources		Annual Freshwater Withdrawals (m ³ billion)	Water Productivity ^a (constant 2010 \$ per m ³)
	(m ³ billion per year)	(m ³ per inhabitant per year)		
	2017	2017 ^b		
Developing ADB Member Economies				
Central and West Asia	370	1,155		
Afghanistan	47	1,327	20 (2000)	...
Armenia	7	2,341	3 (2017)	3.5 (2015)
Azerbaijan	8	826	13 (2017)	4.4 (2012)
Georgia	58	14,859	2 (2008)	6.2 (2008)
Kazakhstan	64	3,535	21 (2016)	7.4 (2010)
Kyrgyz Republic	49	8,094	8 (2006)	0.5 (2006)
Pakistan	55	279	184 (2008)	0.9 (2008)
Tajikistan	63	7,114	11 (2006)	0.4 (2006)
Turkmenistan	1	244	28 (2004)	0.4 (2004)
Uzbekistan	16	512	53 (2016)	0.5 (2005)
East Asia^c	2,913	1,948		
China, People's Republic of	2,813	1,952	594 (2015)	15.0 (2015)
Hong Kong, China	...	...	...	...
Korea, Republic of	65	1,272	29 (2005)	30.8 (2005)
Mongolia	35	11,313	0 (2016)	12.3 (2009)
Taipei, China	...	...	...	...
South Asia	1,880	1,209		
Bangladesh	105	638	36 (2008)	2.9 (2008)
Bhutan	78	96,582	0 (2008)	3.9 (2008)
India	1,446	1,080	648 (2010)	2.6 (2010)
Maldives	0	69	...	...
Nepal	198	6,763	9 (2006)	1.4 (2006)
Sri Lanka	53	2,529	13 (2005)	3.2 (2005)
Southeast Asia	4,985	7,699		
Brunei Darussalam	9	19,827	...	...
Cambodia	121	7,535	2 (2006)	4.1 (2006)
Indonesia	2,019	7,648	223 (2016)	4.0 (2000)
Lao People's Democratic Republic	190	27,763	3 (2005)	1.4 (2005)
Malaysia	580	18,341	11 (2005)	18.3 (2005)
Myanmar	1,003	18,793	33 (2000)	0.5 (2000)
Philippines	479	4,565	85 (2016)	2.3 (2009)
Singapore	1	105	...	...
Thailand	225	3,252	57 (2007)	5.5 (2007)
Viet Nam	359	3,762	82 (2005)	1.0 (2005)
The Pacific^c	892	78,701		
Cook Islands	...	...	...	...
Fiji	29	31,530	0 (2005)	35.7 (2005)
Kiribati	...	...	...	...
Marshall Islands	...	...	...	...
Micronesia, Federated States of	...	...	...	...
Nauru	...	...	...	...
Niue	...	...	...	...
Palau	...	...	...	...
Papua New Guinea	801	97,079	0 (2005)	27.3 (2005)
Samoa	...	...	...	...
Solomon Islands	45	73,123	...	...
Timor-Leste	8	6,339	1 (2004)	1.6 (2004)
Tonga	...	...	...	...
Tuvalu	...	...	...	...
Vanuatu	10	36,206	...	...
Developed ADB Member Economies	1,249	7,974		
Australia	492	20,123	16 (2016)	78.4 (2015)
Japan	430	3,373	81 (2009)	67.4 (2009)
New Zealand	327	69,486	5 (2010)	28.2 (2010)
DEVELOPING ADB MEMBER ECONOMIES^c	11,040	2,740		
ALL ADB REGIONAL MEMBERS^c	12,289	2,936		

... = data not available, 0 = magnitude is less than half of unit employed, \$ = United States dollars, ADB = Asian Development Bank, m³ = cubic meter.

a Gross domestic product in constant 2010 United States dollars per cubic meter of total freshwater withdrawal.

b Regional aggregates are weighted averages estimated using population.

c For reporting economies only.

Sources: Food and Agriculture Organization of the United Nations. AQUASTAT Database. <http://www.fao.org/nr/water/aquastat/data/query/index.html> (accessed 25 July 2019); and World Bank. World Development Indicators Online. <http://data.worldbank.org/indicator> (accessed 25 July 2019).